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And the five numbers are $xy=l^2-1$, x, y, $2l+x+y$, $4l(l+x)(l+y)$, and $v=\dfrac{2r+2p(s+1)}{(s-1)^2}$.

$r=xyz+xyu+xzu+yzu$; $s=xyzu$ and $p=x+y+z+u$.

If $l^2=4$ then the five numbers$=1$, 3, 8, 120, and $\dfrac{777480}{(2879)^2}$.

If $l^2=25$ then the five numbers$=1$, 24, 35, 3480, not carried out.
2, 12, 24, 2380, not carried out.
3, 8, 21, 2080, not carried out.
4, 6, 20, 1980, $\dfrac{3822388020}{(950399)^2}$.

The Hillsboro Mathematical Club have solved for an integral value by extending the series, without result.
A. H. Bell.

AVERAGE AND PROBABILITY.

65. Proposed by J. SCHEFFER, A. M., Hagerstown, Md.

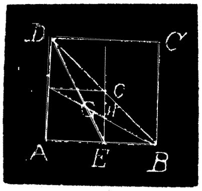
What is the average rate of the sun's motion in declination from the equator to the solstices ?

No solution of this problem has been received.

66. Proposed by REV. W. ALLEN WHITWORTH, A. M.

A rod 9 feet long is to be divided into three parts, of which A is to have the largest, B the next, and C the smallest. If the two fractures are made at random, A's, B's, and C's expectations will be, respectively, 66, 30, and 12 inches. But, if one fracture be made at random and the larger portion of the rod be then divided at random, their expectations will be 64, 31, and 13 inches.

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Science and Mathematics, Chester High School, Chester, Pa.



Let $AB=AD=108=a$, $AE=AF=\frac{1}{2}a$.

I. To find the mean value of the least part, we find the values or limits of x, y by restricting the point to the area GOH. The limits for the denominator are given by restricting the point to GOB.

$$\therefore L=\frac{\displaystyle\int_{\frac{1}{3}a}^{\frac{1}{2}a}\int_{\frac{1}{2}(a-x)}^{x} xdxdy}{\displaystyle\int_{\frac{1}{3}a}^{\frac{1}{2}a}\int_{\frac{1}{2}(a-x)}^{x} dxdy+\int_{\frac{1}{2}a}^{a}\int_{\frac{1}{2}(a-x)}^{a-x} dxdy}=\frac{\dfrac{a^3}{108}}{\dfrac{a^2}{12}}=\tfrac{1}{9}a=12 \text{ inches.}$$

For the mean value of the greatest part the limits are the same for both integrations :

$$\therefore G=\frac{\int_{\frac{1}{3}a}^{\frac{1}{2}a}\int_{\frac{1}{2}(a-x)}^{x} xdxdy+\int_{\frac{1}{2}a}^{a}\int_{\frac{1}{2}(a-x)}^{a-x} xdxdy}{\int_{\frac{1}{3}a}^{\frac{1}{2}a}\int_{\frac{1}{2}(a-x)}^{x} dxdy+\int_{\frac{1}{2}a}^{a}\int_{\frac{1}{2}(a-x)}^{a-x} dxdy}=\frac{\frac{11a^3}{216}}{\frac{a^2}{12}}=\tfrac{11}{18}a=66 \text{ inches.}$$

$\therefore M=a-(\frac{1}{9}a+\frac{11}{18}a)=\frac{5}{18}a=30$ inches.

II. For the mean value of the least part, the limits for x are found by restricting the point to the area *ADG*, for y, by restricting the point to *AEHG* and doubling.

$$\therefore L=\frac{\int_{0}^{\frac{1}{3}a}\int_{x}^{a-2x} xdxdy+2\left[\int_{0}^{\frac{1}{3}a}\int_{y}^{\frac{1}{2}(a-y)} ydydx+\int_{\frac{1}{3}a}^{\frac{1}{2}a}\int_{a-2x}^{\frac{1}{2}(a-x)} ydxdy\right]}{\int_{0}^{\frac{1}{2}a}\int_{0}^{a-x} dxdy},$$

$$=\left[\frac{a^3}{54}+\frac{a^3}{54}+\frac{7a^3}{864}\right]\div\frac{3a^2}{8}=\frac{13a}{108}=13 \text{ inches.}$$

For the mean value of the greatest part, x is given by restricting the point to *GOE*, y, by *DFGO* and doubling.

$$\therefore G=\frac{\int_{\frac{1}{3}a}^{\frac{1}{2}a}\int_{a-2x}^{x} xdxdy+2\left[\int_{\frac{1}{2}a}^{a}\int_{0}^{a-y} ydydx+\int_{\frac{1}{3}a}^{\frac{1}{2}a}\int_{a-2y}^{y} ydydx\right]}{\int_{0}^{\frac{1}{2}a}\int_{0}^{a-x} dxdy},$$

$$=\left[\frac{a^3}{54}+\frac{a^3}{6}+\frac{a^3}{27}\right]\div\frac{3a^2}{8}=\frac{16a}{27}=64 \text{ inches.}$$

$$\therefore M=a-\left[\frac{13a}{108}+\frac{16a}{27}\right]=\frac{31a}{108}=31 \text{ inches.}$$

67. Proposed by B. F. FINKEL, A.M.,M.Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

A person writes n letters and addresses n envelopes; if the letters are placed in the envelopes at random, what is the probability that every letter goes wrong? [From *Hall and Knight's Higher Algebra.*]

Solution by G. B. M. ZERR, A.M., Ph. D., Professor of Mathematics and Science, Chester High School, Chester, Pa.

Let a, b, c, ...n represent the letters.

The number of all possible cases is $1.2.3\ldots\ldots n=n!=u_n$ say.

The number of cases, the first letter a, and envelope used is u_{n-1}.